S3: Social-network Simulation System with Large Language Model-Empowered Agents

Abstract

Social network simulation plays a crucial role in addressing various challenges within social science. It offers extensive applications such as state prediction, phenomena explanation, and policy-making support, among others. In this work, we harness the formidable human-like capabilities exhibited by large language models (LLMs) in sensing, reasoning, and behaving, and utilize these qualities to construct the S^3 system (short for $\textbf{S}$ocial network $\textbf{S}$imulation $\textbf{S}$ystem). Adhering to the widely employed agent-based simulation paradigm, we employ prompt engineering and prompt tuning techniques to ensure that the agent's behavior closely emulates that of a genuine human within the social network. Specifically, we simulate three pivotal aspects: emotion, attitude, and interaction behaviors. By endowing the agent in the system with the ability to perceive the informational environment and emulate human actions, we observe the emergence of population-level phenomena, including the propagation of information, attitudes, and emotions. We conduct an evaluation encompassing two levels of simulation, employing real-world social network data. Encouragingly, the results demonstrate promising accuracy. This work represents an initial step in the realm of social network simulation empowered by LLM-based agents. We anticipate that our endeavors will serve as a source of inspiration for the development of simulation systems within, but not limited to, social science.